1. General

1.01 The purpose of this technical reference is to minimize the potential for interference between unbundled loops and embedded and known future services or technologies that operate in the Bell Atlantic (BA) metallic subscriber loop environment. This document is intended to be a living document that will be updated from time to time to add information about new services and technologies or to remove information that is no longer applicable.

1.02 This technical reference will be updated during 1999 to reflect the spectrum management standard that is currently under development in Committee T1. When this technical reference is updated, the reasons will be given in this paragraph.

1.03 Unbundled loops enable a Certified Local Exchange Carrier (CLEC) that is collocated in a BA Central Office (CO) to connect to BA subscriber loops that are designed to support specific analog and digital technologies that have defined signaling and transmission characteristics. All of the unbundled loops described in this document may not be available in every jurisdiction.

1.04 When CLECs use BA unbundled loops to provide their own services to end-user customers they usually share a BA metallic multi-pair cable with other customers and carriers. This technical reference identifies the guidelines that will be used to ensure that the services and technologies used by CLECs will not receive interference from, or generate interference to, the other services and technologies that share the same cable or an adjacent cable (is this appropriate? Not really. Compatibility in the same cable will ensure compatibility in adjacent cables but we don't need to say it.). The guidelines for unbundled loops are identical to the guidelines used for like BA services and technologies.

1.05 This document is applicable to unbundled loops in metallic multi-pair cables. The guidelines may also be useful for other metallic twisted-pair cables, including, CO cables, multi-pair drop wires, and customer premises cabling.

1.06 BA has a responsibility to its customers for the spectral compatibility of services and technologies that use BA subscriber loops. BA exercises this responsibility by the spectrum management of loop cables so that the potential for interference is minimized.

1.07 Spectrum management includes the responsibility for ensuring that all network equipment and CPE that is connected to subscriber loops conform to the signal power limits associated with the particular service or technology. CLECs that use unbundled loops share this responsibility with BA and shall assure that CLEC equipment and Customer Premises Equipment (CPE) that connects to BA unbundled loops conform to the signal power specifications in this document.

1.08 In order to apply the spectrum management administrative guidelines associated with the assignment of individual cable pairs, BA must know the service/technology that is being used on each metallic subscriber loop cable pair. Since each type of unbundled loop has been defined for use with a specific type of technology with defined signal power limits, CLECs are responsible for correctly identifying and ordering the appropriate type of unbundled loop at the time the loop is ordered for the technology they will be using. (Agreed)
(Internal issue-we need to discuss/develop inventories to track CLEC/BA services. LFACS)

1.09 If the type of service/technology that is used on a particular unbundled loop should change, then the CLEC is responsible for notifying BA of the change so that account records and loop records may be updated.
(Internal inventory issue and how to manage changes to inventories.)

1.10 If the type of technology that a CLEC uses on a particular unbundled loop is different than the type of unbundled loop that was ordered, other services/technologies in the same cable could be harmed. In addition, trouble isolation could be difficult if not impossible.(Agreed) Except as otherwise provided in interconnection agreements, if interference occurs because a CLEC is exceeding the signal power limits for the type of unbundled loop that was ordered, the CLEC shall cease and desist the interference upon notification. When the CLEC conforms to the applicable signal power limits for the type of unbundled service that was ordered, the unbundled loop will be restored. BA reserves the right to disconnect any unbundled loop that causes such interference in the event that the CLEC does not act promptly to cease and desist such interference upon notification.

1.11 If the type of technology that a CLEC uses on a particular unbundled loop is different than the type of unbundled loop that was ordered, the CLEC service/technology could inadvertently receive interference when an incompatible service/technology is legitimately assigned to a loop in the same binder group or cable. BA is not responsible for the interference in such cases.

1.12 BA unbundled loops support specific analog and digital technologies that have specific signaling and transmission characteristics that are defined in BA technical references. The signaling and transmission characteristics associated with each type of unbundled loop are important considerations when BA loop facilities are maintained, rearranged, or modernized. If the type of technology that a CLEC uses on a particular unbundled loop is different than the type of unbundled loop that was ordered, the CLEC service/technology could be inadvertently interrupted or harmed when BA loop facilities are rearranged or modernized. BA is not responsible for service interruptions in such cases.

1.13 Customers and CLECs that connect equipment to BA unbundled loops shall conform to the terms and conditions in BA tariffs and contracts as well as the requirements in the technical references identified in this document. In addition, CPE shall meet the applicable signal power limits of Part 68 of the FCC Rules and Regulations.

1.14 Is this paragraph same as 1.10? (Basicly, Yes. Charlie saw this too. He had me reword 1.10, took out the procedure there and referred to the procedure here.) If the CLEC equipment or CPE connected to an unbundled loop exceeds the applicable signal power limits and causes interference with BA services/technologies, the CLEC must cease and desist such interference upon notification. When the CLEC equipment and associated CPE conforms to the applicable signal power limits for the applicable type of unbundled loop, the unbundled loop will be restored. BA reserves the right to disconnect any unbundled loop that causes such interference in the event that the CLEC does not act promptly to cease and desist such interference upon notification.

1.15 This document is divided into several sections that will address the following areas:

- **Section 2 - Background Information:** Provides information about spectrum management, multi-pair cables, crosstalk, and spectral compatibility.
- **Section 3 - Signal Power Limits and Technology Deployment Restrictions:** Provides the specific signal power limits and Power Spectral Density (PSD) templates as well as the technology deployment restrictions associated with each type of unbundled loop and each type of service/technology that is currently being deployed, or planned for deployment, in BA.
- **Section 4 - Potential Incompatibilities and Associated Loop Assignment Guidelines:** Provides information about services or technologies that have the potential to interfere with other services or technologies and provides the loop assignment guidelines that will be used to minimize the potential for interference between services in the same multi-pair cable.
- **Section 5 - Facility Augmentation:** Provides information about the alternatives that are available for unbundled loops when no suitable facilities exist.
- **Section 6 - Noise Maintenance Limits for Unbundled Loops:** Provides noise maintenance limits for each type of unbundled loop.
- **Section 7 - Noise Mitigation Practices for Unbundled Loops:** Provides information about the alternatives that are available when noise maintenance limits are exceeded on unbundled loops.
- **Section 8 - Spectral Compatibility Analysis:** Describes the methodology associated with the spectral compatibility analysis that shall be performed by the CLEC when proposed new services or technologies are planned for deployment on unbundled loops.

2. Background Information

A. Spectrum Management Guidelines

2.01 Services and transmission system technologies must coexist, and be compatible with, other services and transmission technologies in the local loop environment.

2.02 In order to achieve compatibility, energy that transfers or couples into a loop, from services and technologies on other pairs in the same cable, must not result in unacceptable degradation of performance. In addition, energy in the loop itself must not transfer into other pairs in the same cable in a manner that causes an unacceptable degradation in the performance of the services and technologies on those pairs.

2.03 The electromagnetic energy that couples into a pair from services and technologies on other pairs in the same cable is unwanted energy and is considered to be noise (even when it is not audible). The noise may, or may not, be disturbing. When the noise signals are strong enough, they can interfere with the service or technology that is using the pair. This phenomenon is called crosstalk interference.

2.04 Preventing crosstalk interference requires careful manufacturing, installation, maintenance, and administration of multi-pair cables.

2.05 The administration of multi-pair cables to minimize the potential for interference between embedded and known future services or technologies that operate in the metallic subscriber loop environment is called spectrum management. Spectrum management guidelines include loop engineering practices consisting of:

- Signal power limits that specify the amplitude and frequency distribution of electrical signals that can be applied to the pairs of a multi-pair cable;
- Technology deployment guidelines that control how technology is used;
- Loop assignment guidelines and inventories (Agreed) that are intended to manage the proximity of certain services or technologies to other services or technologies in the same cable; and,
- A spectral compatibility evaluation process, performed by the CLEC, that is used to determine the impact of proposed new services or technologies on embedded services and technologies. (No, here we are speaking generically. The same process is used by both BA and CLEC.)

2.06 Conforming to BA spectrum management guidelines will minimize the potential for interference with, and interference from, embedded services and technologies and known future services and technologies that use pairs in the same multi-pair metallic cable.

2.07 The services and technologies that use unbundled loops shall be compatible with BA services and technologies and other unbundled loops in the same multi-pair cable. If it is not compatible, the service/technology must be removed as specified, in accordance with CLEC interconnection agreements.
(Agreed)

B. Multi-pair Metallic Subscriber Loop Cables

2.08 The subscriber loop plant consists for the most part of multi-pair metallic cables that were designed primarily for Plain Ordinary Telephone Service (POTS) and other voice grade services.

2.09 A signal transmitted on a cable pair creates an electromagnetic field that surrounds other pairs in the cable. This electromagnetic field induces voltages on nearby pairs. To minimize this coupling, paired insulated conductors are twisted together and tightly bundled into pair units called binder groups. Despite these measures however, a capacitive coupling still exists between the pairs in the cable.

C. Crosstalk

2.10 Electromagnetic energy that couples into a metallic cable pair from services and technologies on other pairs in the same cable is called crosstalk interference, crosstalk noise, or just plain crosstalk. Crosstalk is sensitive to frequency, signal strength, and exposure.

2.11 High frequency energy couples into other pairs more than low frequency energy because as the signal frequency increases, the crosstalk coupling loss between the pairs of a multi-pair cable decreases. Hence, the higher the frequency, the greater the crosstalk power at the place in the loop where the crosstalk occurs. This is the reason that technologies such as ISDN Basic Rate, High-Bit-Rate Digital Subscriber Line (HDSL), and Asymmetrical Digital Subscriber Line (ADSL) cause more interference than voice grade technologies.

2.12 A strong signal traveling through a pair will transfer more power into other pairs than will a weaker signal. In fact, the amount of crosstalk power is directly proportional to the power of the signal at the place in the circuit where the crosstalk occurs, everything else being equal. The stronger the disturbing signal, the greater the crosstalk. Thus, an effective means of controlling crosstalk is to limit the signal energy that is applied to cable pairs.

2.13 Exposure is a measure of the proximity of metallic pairs at various points along a cable run and the length over which pairs are in close proximity. The greater the exposure, the greater the total crosstalk power over the length of the circuit. It is impossible to predict the exact amount of exposure between any two pairs in a cable, however statistical exposure models can be used for crosstalk margin evaluations.

2.14 With a disturbing signal source at the near-end of a cable, The total crosstalk noise power that would be measured on a victim pair at the near-end of the cable is called Near-End-Crosstalk (NEXT). The total crosstalk noise power measured on a victim pair at the far-end of the cable is called the Far-End-Crosstalk (FEXT). (Is the near-end considered to be at the CO end and the far-end near the end user end, or do I have these reversed?) If it is possible to explain where "near and far" ends are or could be, might be helpful. (Actually, near-end and far-end are relative to where you are standing. If you are at the end-user location the near end is your NID and the CO is the far end. NEXT and FEXT on the other hand are relative to the source of the disturbing signal. If the disturbing singal is at the same end of the cable as the victim, then that's NEXT. If the source of the disturbing signal is at the other end of the cable, then that is FEXT. Only important for spectral compatibility evaluations. Tried to clarify by changing the sentence as shown above.)

2.15 NEXT is usually more burdensome than FEXT when transmission takes place in both directions in a binder group. This is particularly true if the service/technology on the disturbed pair is carrying a signal in the opposite direction from that of the service/technology on the disturbing pair. In this case, NEXT becomes a problem when a strong crosstalking signal (noise) interferes with a weakened received signal.

D. Spectral Compatibility

2.16 Crosstalk is the physical process that enables one service or technology to disturb another service or technology. Spectral compatibility is the capability of two systems to operate in the presence of crosstalk from each other.

2.17 Service/technology A is considered to be compatible with service/technology B as a disturber system when signal A is carried on a pair in a binder group with all of the other pairs in the binder group carrying signal B and service/technology A performs at its full transmission rate and at its maximum desired range. If service/technology A is compatible with service/technology B as the disturbing system and B is compatible with A as the disturbing system, A and B are considered to be fully compatible.

2.18 Although full compatibility is desirable it is not always possible. When less than full compatibility exists between various services and/or technologies, it is desirable to develop spectrum management guidelines that permit some degree of compatibility. For example, it is often possible to limit the maximum loop range of services or technologies to ensure spectral compatibility. Thus, for certain services or technologies, observance of maximum range limits avoids crosstalk problems.

2.19 As new services and technologies have been introduced into the loop environment, spectrum management guidelines have been developed to minimize the potential for interference to and from other services that share the same multi-pair cables.

2.20 The most important spectrum management guidelines specify the amplitude, frequency distribution, and total power of electrical signals at the point where the signal enters the subscriber loop cable. These service and technology signal power limits are contained in Section 3.

2.21 Another useful spectrum management technique is loop assignment guidelines that help to achieve spectral compatibility by controlling the amount of exposure between potential disturber technologies and potential disturbed technologies. Since it is impossible to predict the exact amount of exposure between any two pairs in a binder group or a cable, this method is less effective than signal power limits in preventing crosstalk interference however it is sometimes useful in mitigating crosstalk interference. Loop assignment guidelines are contained in Section 4.

2.22 In order to achieve spectral compatibility for new services and technologies, BA has established an evaluation process that determines the impact of proposed new services or technologies on embedded services and technologies. This process is described in Section 8.

3. Signal Power Limits and Technology Deployment Restrictions

Does the type of facility that the loop is provisioned on (i.e., copper, DLC, fiber, etc. change any of the information is this section or cause us to have to uniquely identify specifications associated with any of these facilities? (No. This is only applicable to metallic cables which includes loops that are entirely metallic and the metallic portion of a DLC loop.)

3.01 To minimize the potential for crosstalk interference in metallic multi-pair cables, it is necessary to restrict the amplitude, frequency distribution, and total power of electrical signals at the point where a potentially interfering signal enters the subscriber loop cable. In addition, technology deployment restrictions, such as those for ADSL, prevent non-standard applications in order to minimize the potential for interference. Any technology used in the BA loop plant must meet the signal power limits and technology deployment restrictions specified in this section.

3.02 This section provides the signal power limits and technology deployment restrictions associated with each type of unbundled loop and each category of BA services and technologies. The service and technology categories represent the types of analog and digital signals that are transported on metallic subscriber loops. Each service and technology description includes a reference that contains additional information about the equipment connected to these services and the signals that are generated onto the local loop.

A. Unbundled Loops

A.1 Unbundled 2-Wire Analog Loop (2WA)

3.03 An unbundled 2WA[1] provides the CLEC with an effective 2-wire channel that is suitable for the transport of analog voice grade (300 to 3000 Hz) signals and loop-start signaling as described in ANSI T1.401-1993 [1]. The 2WA is described more fully in Bell Atlantic TR 72565 [2]. A typical unbundled 2WA configuration is illustrated in Figure 3-1.

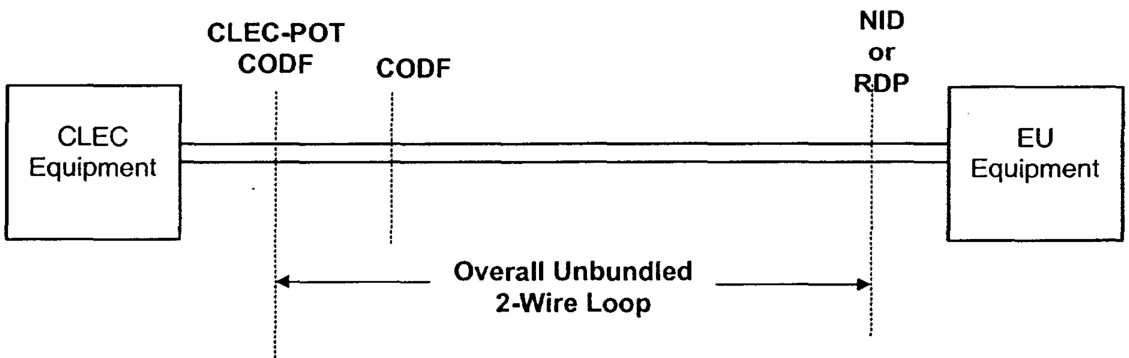

Figure 3-1. Typical Unbundled 2-Wire Loop Configuration

3.04 The maximum power level of any signal transmitted by CLEC equipment that is connected to an unbundled 2WA, when averaged over 3 seconds, shall not exceed -12 dBm0.

3.05 CPE that is connected to an unbundled 2WA shall meet the applicable signal power limits in Part 68 of the FCC Rules [3].

[1] The Unbundled 2-Wire Analog Loop was previously called a Basic Unbundled Loop Service (BULS) or a Basic Link.

A.2 Unbundled 2-Wire and 4-Wire Analog Loops with Customer Specified Signaling

3.06 Unbundled 2-wire and 4-wire analog loops with customer specified signaling provide the CLEC with an effective 2-wire channel or an effective 4-wire channel that is suitable for the transport of analog voice grade (300 to 3000 Hz) signals and any one of a variety of signaling types such as loop-start, ground-start, loop-reverse-battery, etc. Unbundled 2-wire and 4-wire analog loops with customer specified signaling are described more fully in Bell Atlantic TR 72570 [4]. A typical unbundled 2-wire analog loop with customer specified signaling configuration is illustrated in Figure 3-1 and a typical unbundled 4-wire analog loop with customer specified signaling configuration is illustrated in Figure 3-2.

3.07 The maximum power level of any signal transmitted by CLEC equipment that is connected to an unbundled 2-wire or 4-wire analog loop with customer specified signaling, when averaged over 3 seconds, shall not exceed -13 dBm0.

3.08 CPE that is connected to an unbundled 2-wire or 4-wire analog loop with customer specified signaling shall meet the applicable signal power limits in Part 68 of the FCC Rules [3].

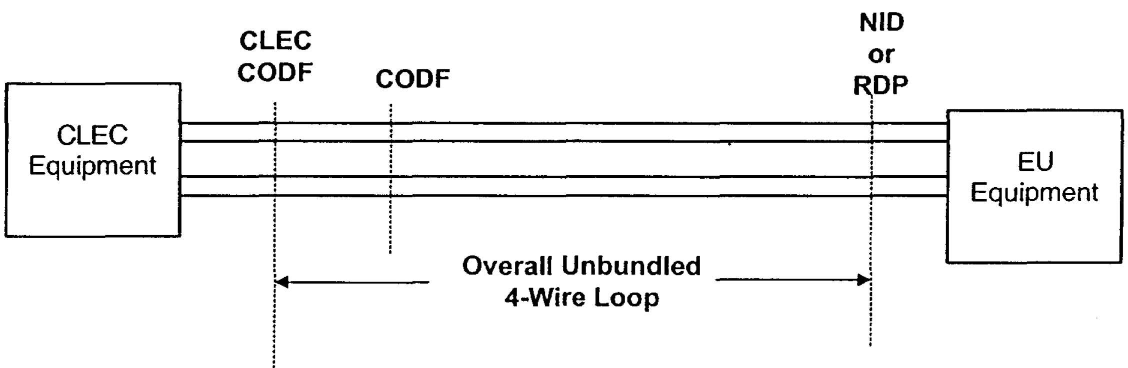

Figure 3-2. Typical Unbundled 4-Wire Loop Configuration

A.3 Unbundled 2-Wire Digital ISDN-Qualified (2WDI) Loop

3.09 An unbundled 2WDI loop provides the CLEC with an effective 2-wire channel that is suitable for the transport of 160 kbps digital signals in both directions simultaneously using the Two-Binary One-Quaternary (2B1Q) line code described in ANSI T1.601 [5]. The unbundled 2WDI loop is more fully described in Bell Atlantic TR 72575 [6]. A typical unbundled 2WDI loop configuration is illustrated in Figure 3-1.

3.10 An unbundled 2WDI loop does not support vendor-specific non-standard line codes and the spectrum management guidelines for the unbundled 2WDI loop in this document do not apply to such applications.

3.11 CLEC or CPE equipment that is connected to an unbundled 2WDI loop shall meet the ISDN Basic Rate Power Spectral Density (PSD) template in Figure 3-3 below. To verify compliance with this requirement, measurements shall use a noise power bandwidth of 1 kHz. How is this tested and by whom? (Compliance of sample units are normally tested in a lab prior to purchase or deployment. The entity connecting the equipment to the loop is responsible for determining and maintaining compliance.)

3.12 CPE that is connected to an unbundled 2WDI loop shall meet the applicable signal power limits in Part 68 of the FCC Rules [3] and ANSI T1.601 [5].

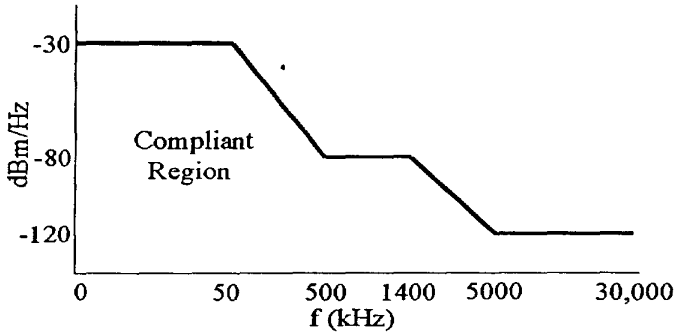

Figure 3-3. Power Spectral Density Template for ISDN Basic Rate Technology

A.4 Unbundled 4-Wire Digital DS1 (4WD1.5) Loop

3.13 An unbundled 4WD1.5 loop provides the CLEC with a 4-wire transmission channel that is suitable for the transport of 1.544 Mbps (DS1) digital signals in both directions simultaneously. The unbundled 4WD1.5 loop is described more fully in Bell Atlantic TR 72575 [6]. A typical unbundled 4WD1.5 loop configuration is illustrated in Figure 3-4.

3.14 Direct-current power shall not be delivered to the 4WD1.5 EU-POT CPE. In addition, CPE shall not apply voltages to the EU-POT other than those described in ANSI T1.403 [7].

3.15 CLEC equipment that is connected to an unbundled 4WD1.5 loop shall meet the DSX-1 signal power limits in ANSI T1.102 [8].

3.16 CPE that is connected to an unbundled 4WD1.5 loop shall meet the applicable signal power limits in ANSI T1.403 [7] and Part 68 of the FCC Rules [3].

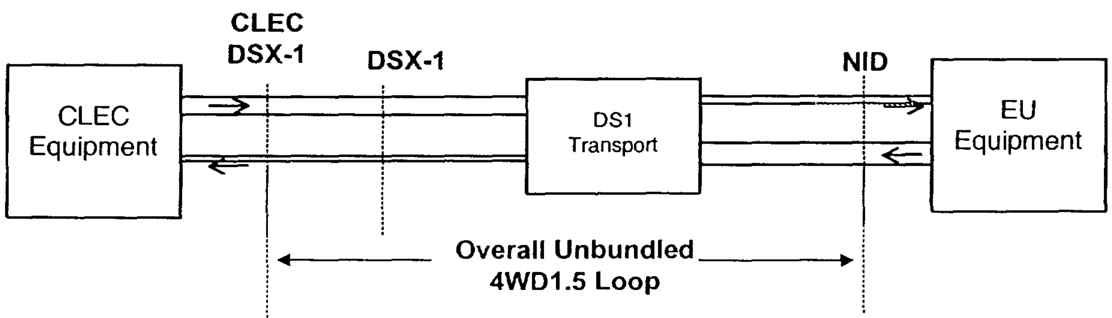

Figure 3-4. Typical Unbundled 4-Wire Digital DS1 Loop Configuration

A.5 Unbundled 4-Wire Digital 56 kbps DDS (4WD56) Loop

3.17 An unbundled 4WD56 loop provides the CLEC with a 4-wire transmission channel that is suitable for the transport of digital data at a synchronous rate of 56 kbps simultaneously in both directions. An optional secondary channel operating at 8 kbps is also available. An unbundled 4WD56 loop can also be used to transport 56 kbps Type I Public Switched Digital Service (PSDS). The unbundled 4WD56 loop is more fully described in Bell Atlantic TR 72575, Issue 2 or later [6].

3.18 When metallic cable facilities are used for an unbundled 4WD56 loop, the CLEC is expected to provide sealing current on the simplex path to the EU-POT. The end-user is expected to provide a simplex path termination to the CLEC. Sealing current is used to seal splices and control a loopback relay in the CPE. The sealing current associated with an unbundled 4WD56 loop is limited to 120 mA maximum and -130 Vdc maximum. Only dc voltages that are negative with respect to ground may be used for sealing current on unbundled 4WD56 loops.

3.19 When metallic cable facilities are used to provide an unbundled 4WD56 loop, the interface to the CLEC shall consist of balanced modified bipolar return-to-zero (BPRZ) signals at the customer data rate. The bipolar format is modified by the inclusion of bipolar violations for network control.

3.20 Direct-current power shall not be delivered to the EU-POT by CPE. In addition, CPE shall meet the applicable signal power limits in ANSI T1.410 [9] and Part 68 of the FCC Rules [3].

A.6 Unbundled 2-Wire or 4-Wire Digital HDSL-Qualified Loops

I know this TR specifically address metallic facilities, however, in the HDSL and ADSL descriptions, do we want to repeat that the "qualified" facilities are currently on copper? (I don't think its necessary. TR72575 should be consulted for the detailed description.)

3.21 Two types of High-Bit-Rate Digital Subscriber Line (HDSL) unbundled loops are offered: the unbundled 2-Wire Digital HDSL-Qualified (2WDH) loop and the unbundled 4-Wire Digital HDSL-Qualified (4WDH) loop. Both the 2WDH or 4WDH loops are suitable for the transport of 2B1Q line code signals that meet the specifications of T1 Technical Report No. 28 [10] and Bell Atlantic TR 72575, Issue 2 [6]

3.22 The unbundled 2WDH loop provides transport for bi-directional full duplex 784 kbps digital signals that support a 768 kbps payload plus framing (8 kbps) and overhead (8 kbps). This is sometimes called single-loop operation. A typical unbundled 2WDH loop configuration is illustrated in Figure 3-1.

3.23 The unbundled 4WDH loop provides transport for two bi-directional full duplex 784 kbps digital signals each of which supports a 768 kbps payload plus framing (8 kbps) and overhead (8 kbps). The two bi-directional signals can be used to transport a DS1 service. This method of operation is sometimes called dual duplex or two full pair full duplex operation. A typical unbundled 4WDH loop configuration is illustrated in Figure 3-2.

3.24 The spectrum management guidelines for unbundled 2WDH and 4WDH loops in this document apply to applications that use the 2B1Q line code and the guidelines may not be applicable to other line codes.

3.25 CLEC or CPE equipment connecting to unbundled 2WDH or 4WDH loops shall meet the applicable signal power limits in T1 Technical Report No. 28 [10], Part 68 of the FCC Rules [3], and the PSD template in Figure 3-5.

Do we need to address mid-spans on HDSL? Is digital signal or payload or spectrum concerns different that what you have stated here when mid-span on HDSL? (Yes, we need to address HDSL repeaters after we have determined our own internal policy. HDSL repeaters will interfere with ADSL and RADSL so we need to decide how we will handle such interference. Whatever we decide to do will apply to the CLECs.)

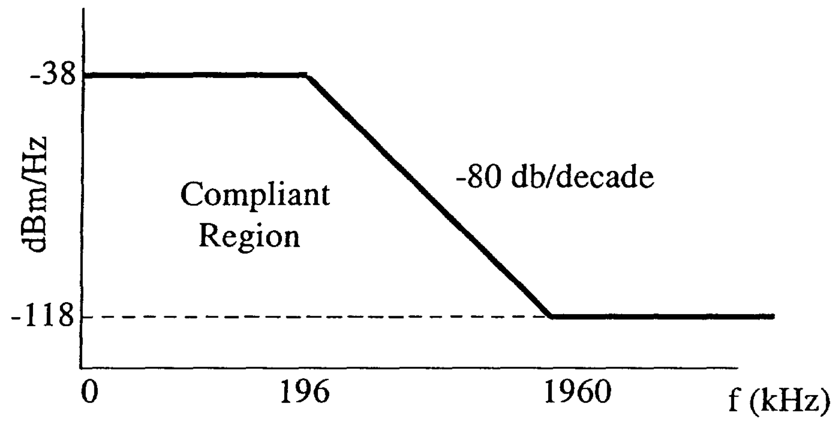

Figure 3-5. Power Spectral Density Template for HDSL Technology

3.26 Loop power or sealing current that is applied to an unbundled 2WDH or 4WDH loop shall not exceed the Class A3 voltage limits in Bellcore GR-1089-CORE [11]. Only dc voltages that are negative with respect to ground may be used for sealing current.

3.27 The unbundled 2WDH loop is not intended to support single-pair 1.544 Mbps full duplex HDSL systems that use a single pair and an echo canceled hybrid method to carry a 1.544 Mbps payload plus overhead in both directions simultaneously. The spectrum management guidelines for unbundled 2WDH loops in this document are not applicable to this type of HDSL system.

3.28 The unbundled 4WDH loop is not intended to support Dual-Simplex (2-pair simplex) HDSL systems that use two pairs each carrying a unidirectional signal at a nominal 1.544 Mbps rate plus overhead. The spectrum management guidelines for unbundled 4WDH loops in this document are not applicable to this type of HDSL system.

A.7 Unbundled 2-Wire Digital ADSL-Qualified (2WDA) Loops

3.29 An unbundled 2-Wire Digital Asymmetrical Digital Subscriber Line (ADSL) qualified loop provides the CLEC with an effective 2-wire channel that is suitable for the transport of POTS as well as digital signals. Two types of unbundled 2WDA loops are offered: the 2WDA-R loop and the 2WDA-C loop. The 2WDA-R loop is non-loaded and 18 kft or less in length and the 2WDA-C loop is non-loaded and 12 kft or less in length. Unbundled 2WDA-R and 2WDA-C loops are described more fully in Bell Atlantic TR 72575, Issue 2 or later [6]. A typical unbundled 2WDA loop configuration is illustrated in Figure 3-1.

3.30 In addition to analog POTS signals, ~~an~~ unbundled 2WDA-R and 2WDA-C loops are suitable for the transport of Discrete Mulit-Tone (DMT) ADSL signals or Carrierless Amplitude and Phase Modulation (CAP) /QAM (?) Rate-Adaptive Digital Subscriber Line (RADSL) signals. Should there be any mention of CAP being a non-standard technology? (I see no need to mention that.)

3.31 The data rate achieved on a particular unbundled 2WDA-R or 2WDA-C loop depends upon the performance of CLEC and EU customer-provided modems with the electrical characteristics (length, bridged tap, noise, etc.) associated with the loop. In addition to CLEC and EU modems, could CLEC DSLAM affect data rate achieved? (Yes, but here we are speaking about the modem function so the DSLAM is included. It does not matter what package the modem function is in, we will not guarantee the data rate.)

3.32 Unbundled 2WDA-R and 2WDA-C loops are suitable for the transport of ADSL signals that meet the DMT specifications of ANSI T1.413-1998 [12] or RADSL signals that meet the CAP/QAM specifications of T1E1.4/98-294 [13].

3.33 ADSL CPE used with an unbundled 2WDA-R or 2WDA-C loop shall meet the signal power limits in Part 68 of the FCC Rules [3], and the upstream Power Spectral Density (PSD) template in Figure 3-6. RADSL CPE used with an unbundled 2WDA-R or 2WDA-C loop shall meet the signal power limits in Part 68 of the FCC Rules [3], and the upstream PSD template in Figure 3-7. In addition, the power transmitted by ADSL and RADSL CPE in any 1 MHz sliding window from 1630 kHz to 11040 kHz shall not exceed –50 dBm.

3.34 CLEC ADSL equipment (where? In CO or at EU prem?) connecting to an unbundled 2WDA-R or 2WDA-C loop shall meet the downstream PSD template in Figure 3-8. CLEC RADSL equipment connecting to an unbundled 2WDA-R or 2WDA-C loop shall meet the downstream PSD template in Figure 3-9. In addition, the power transmitted by CLEC ADSL and RADSL equipment in any 1 MHz sliding window from 4545 kHz to 11040 kHz shall not exceed –50 dBm. (downstream refers to signals transmitted from the CO)

3.35 Unbundled 2WDA-R and 2WDA-C loops are not intended for applications that have spectral energy at power levels or in frequency bands that can interfere with other unbundled 2WDA-R or 2WDA-C loops in the same cable. Such interfering applications include:

- Reverse ADSL applications (i.e., End-user CPE transmits downstream frequencies and CO equipment transmits upstream frequencies);
- End-user to end-user ADSL applications (i.e., The CPE at one end transmits downstream frequencies);
- Echo canceling ADSL technology or applications that permit the upstream frequency band to overlap the downstream frequency band.
- Applications that use the power boost option described in ANSI T1.413-1995 (i.e., power level exceeds the PSD templates specified in this document).

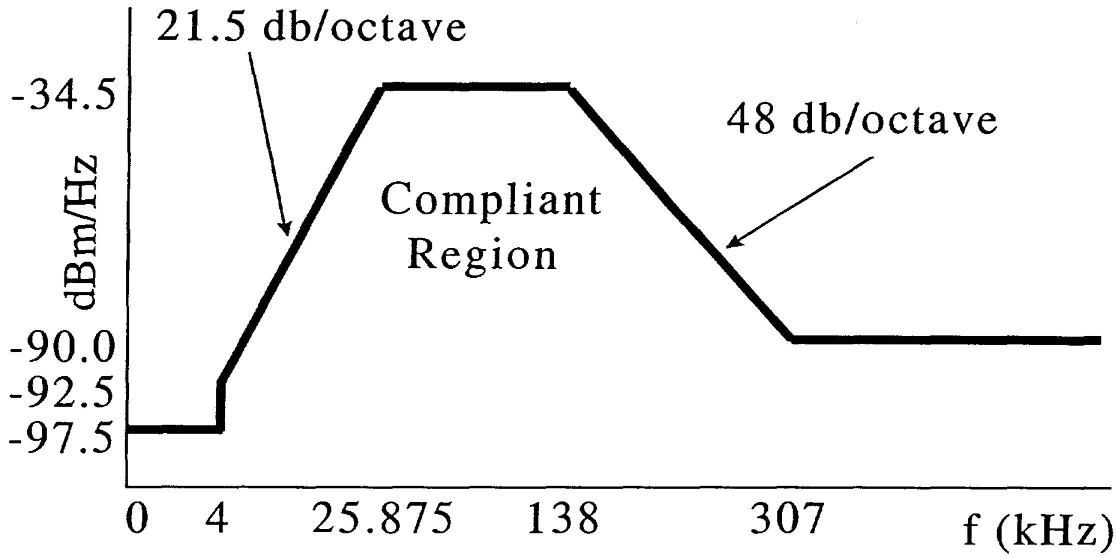

Figure 3-6. DMT Upstream PSD Template for ADSL Technology

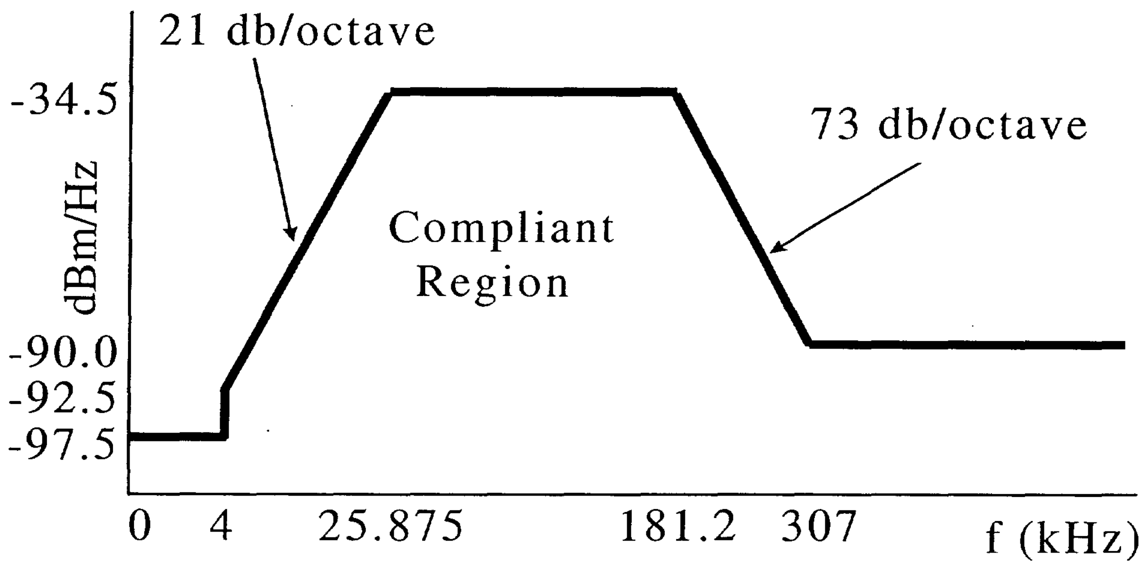

Figure 3-7. Single Carrier RADSL Upstream PSD Template

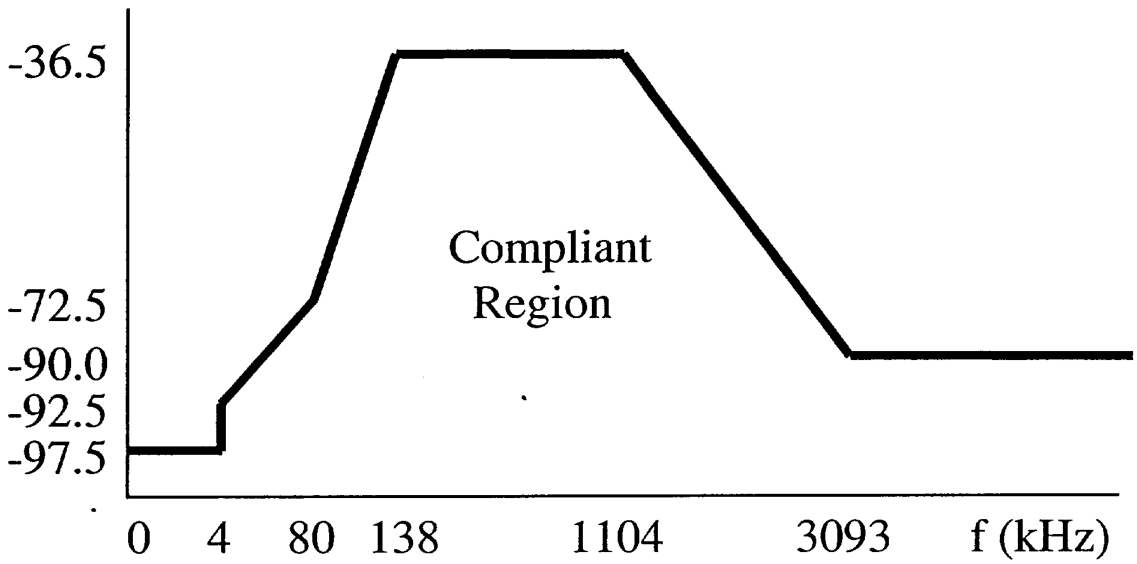

Figure 3-8. DMT Downstream PSD Template for ADSL Technology

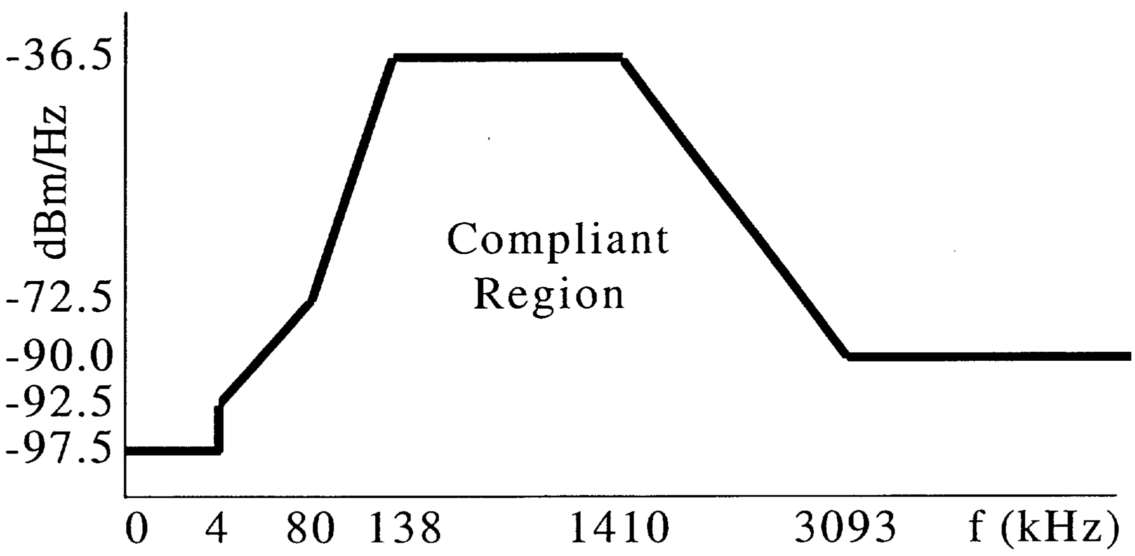

Figure 3-9. Single Carrier RADSL Downstream PSD Template

B. BA Services and Technologies

B.1 Sub-voice Services

3.36 Sub-voice services are private line channels that are suitable for the transport of dc signals or ac signals at rates under 150 baud. These services include 1000 Series Channels and Metallic and Telegraph Grade Special Access Services. Sub-voice services are used for remote metering, supervisory control, and miscellaneous signaling.

3.37 All signals for transmission over the sub-voice services shall be delivered by the CPE balanced to ground except for McCulloh-Loop (alarm) type signaling and dc telegraph transmission at speeds of 75 baud or less.

3.38 Customers using sub-voice services for dc telegraph signaling systems shall be responsible for the provision of current limiting devices to protect BA loop facilities from excessive current due to abnormal conditions. In addition, customers using sub-voice services for dc telegraph signaling systems shall be responsible for the provision of noise mitigation networks when required to reduce excessive noise. Should we consider notification to customers using sub-voice services in regards to their obligations and especially since advanced services including DSLs are being introduced into the network?
(dc telegraph has not been used for many years. I just included this in case there is any left.)
3.39 CPE connected to sub-voice services shall meet the signal power limits in Bellcore document TR-NPL-000336 [14].

B.2 Voice Grade Services

3.40 Voice grade services are suitable for the transport of analog signals in the frequency band from about 300 to 3000 Hz. These services include, but are not limited to, Residential and Business telephone service (POTS), Private Branch Exchange (PBX) CO trunks, Foreign Exchange lines and trunks, PBX Direct Inward Dialing trunks, 2000 Series Channels, 3000 Series Channels, Switched LATA Access Services, and Voice Grade Special LATA Access Services. Additional information may be found in Bellcore technical references TR-NPL-000334 [15] and TR-NL-000335 [16].

3.41 CPE that is connected to voice grade services must meet the voiceband signal power limits in Part 68 of the FCC Rules [3].

B.3 P-Phone Technology

3.42 P-Phone is the industry name for the Nortel Electronic Business Service telephone set. The P-Phone utilizes an out-of-band data link to convey signaling and control information. The data link is implemented using Amplitude Shift Keying on an 8 kHz carrier. Additional information about P-Phone technology may be found in Nortel publication NIS S106-1 [17].

3.43 P-Phone CPE must meet the voiceband signal power limits in Part 68 of the FCC Rules [3].

B.4 Program Audio Services

3.44 Program audio services are private line channels that are suitable for the transport of analog signals up to 15 kHz. These services are referred to as 6000 Series Channels or Program Audio Special Access and Local Channel Services. Program Audio services are used for radio broadcasting, audio recording, television audio, and audio teleconferencing.

3.45 CPE connected to program audio services shall meet the signal power limits in Bellcore document GR-337-CORE [18].

B.5 Digital Data Services (DDS) and Type I Public Switched Digital Service (PSDS)

3.46 DDS services are private line channels that are suitable for the transport of digital signals at 56 kbps and 64 kbps and subrates of 2.4, 4.8, 9.6, 19.2, and 38.4 kbps. These services are referred to as DDS or Digital Data LATA Access Services. Additional information about these services may be found in Bellcore technical reference TR-NPL-000341 [19] and ANSI T1.410 [9].

3.47 Public Switched Digital Services are also known as Switched 56 (SW56) Kbps services. The industry has developed three types of PSDS technologies that are referred to as Type 1, Type 2, and Type 3 in industry standard ANSI TIA/EIA-596 [20]. The technology used for the Type 1 version of PSDS is spectrally compatible with 56 kbps DDS technology.

3.48 CPE that is connected to DDS or Type I PSDS services must meet the applicable signal power limits in Part 68 of the FCC Rules [3].

B.6 Type II and Type III PSDS

3.49 Type II PSDS technology uses the AMI line code operating at 144 kbps on a 2-wire loop to provide full duplex operation at 56 kbps. Type II PSDS uses the AT&T Circuit Switched Digital Capability (CSDC) technology described in ANSI TIA/EIA-596 [20].

3.50 Type III PSDS technology uses the AMI line code operating at 160 kbps on a 2-wire loop to provide a full duplex data operation at 64 kbps and a signaling channel operating at 8 kbps. Type III PSDS uses the Nortel Datapath technology described in ANSI TIA/EIA-596 [20].

3.51 CPE that is connected to Type II or Type III PSDS services must meet the applicable signal power limits in Part 68 of the FCC Rules [3].

B.7 Local Area Data Channel (LADC) Service

3.52 The LADC service is a private line service that provides a channel between two end-user locations that are served out of the same CO. LADC service is intended for limited-distance or "line driver" modem technology that is used for short range transmission at rates from 300 baud through 56 kbps.

3.53 CPE that is connected to an LADC service shall meet the LADC signal power limits in Bell System PUB 41028 [21] and Part 68 of the FCC Rules [3].

B.8 LANGATE and CO-LAN services

3.54 LANGATE and CO-LAN services use various types of Data Voice Multiplexer (DVM) technology.

3.55 CPE that is connected to the LANGATE and CO-LAN services or DVM technology shall meet the applicable signal power limits in Part 68 of the FCC Rules [3].

B.9 Basic Rate ISDN Technology

3.56 Basic Rate ISDN technology is used to provide Basic Rate ISDN service. In addition, Basic Rate ISDN technology is used in Digital Additional Main Line (DAML) equipment for pair gain applications and in dedicated data network applications, which are sometimes referred to as IDSL applications

3.57 Basic Rate ISDN technology uses the echo canceler with hybrid (ECH) principle to provide full-duplex operation over a two-wire loop. The echo canceler produces an approximate replica of the echo of the near-end transmission, which is then subtracted from the total received signal.

3.58 The Basic Rate ISDN line code is 2B1Q. This is a four level pulse amplitude modulation (PAM) code without redundancy. The baud rate is 80 kbaud +/- 5 ppm.

3.59 The spectrum management guidelines for Basic Rate ISDN technology in this document do not apply to vendor-specific non-2B1Q line codes.

3.60 Network and CPE equipment used with ISDN Basic Rate technology shall meet the PSD template in Figure 3-3. To verify compliance with this requirement, measurements shall use a noise power bandwidth of 1 kHz. How is this tested and by whom?

3.61 CPE that is connected to Basic Rate ISDN services shall meet the Basic Rare (typo-Rate) ISDN signal power limits in Part 68 of the FCC Rules [3]. (I put that in to find out who was actually reading the document (just kidding). I'm surprised Charlie missed that. (just kidding again) Thanks).

B.10 Analog Carrier Technology

3.62 BA has used several types of analog carrier technologies in the loop environment. BA is phasing out ACXR technology by replacing it, where possible, with digital or fiber technology. Small amounts of SLC-1, AML, CM-8, and SLC-8 technology still remain in New York and New England.

3.63 Analog carrier technology is deployed and maintained in the loop environment according to each manufacturer's specifications.

B.11 T1 Technology

3.64 Repeatered Alternate Mark Inversion (AMI) T1 technology has been used by BA in the loop environment for Digital Loop Carrier (DLC) systems and end-user DS1 services.

3.65 Network T1 technology must meet the DS1 signal power limits in ANSI T1.403 [7] and ANSI T1.102 [8].

3.66 CPE that is connected to DS1 services that use T1 technology shall meet the DS1 signal power limits in ANSI T1.403 [7] and Part 68 of the FCC Rules [3].

B.12 HDSL Technology

3.67 Two types of HDSL technology are supported: 2-wire and 4-wire. Both types of HDSL technology use the 2B1Q line code and meet the specifications in Bellcore TA-NWT-001210 [22].

3.68 2-wire HDSL technology is used for Fractional T1 applications. 4-wire HDSL technology is used to transport DS1 service.

3.69 All HDSL technology shall meet the PSD template in Figure 3-5.

B.13 ADSL Technology

3.70 ADSL technology provides a 2-wire channel (see Figure 3-1) that is suitable for the transport of POTS and digital signals. Different types of ADSL technology have been developed.

3.71 One type of ADSL technology transmits Discrete Mulit-Tone (DMT) signals that are described in ANSI T1.413-1995 [12]. Another type of ADSL technology transmits Carrierless Amplitude and Phase Modulation (CAP) signals that are described in the Single Carrier RADSL specifications of T1E1.4/98-294 [13]. Both types of ADSL technologies are planned for use by BA Retail to provide Infospeed DSL services. (will do)

3.72 For POTS, ADSL technology supports loop-start signaling that meets the specifications in ANSI T1.401-1995 [1].

3.73 ADSL CPE shall meet the upstream PSD template in Figure 3-6 or the RADSL upstream PSD mask in Figure 3-7. ADSL CO equipment shall meet the downstream PSD template in Figure 3-8 or the RADSL downstream PSD template in Figure 3-9.

3.74 ADSL applications that have spectral energy at power levels or in frequency bands that can interfere with unbundled 2WDA loops and ADSL technologies are not supported. Such applications include:

- Reverse ADSL applications (i.e., End-user CPE transmits downstream frequencies and CO equipment transmits upstream frequencies);
- End-user to end-user ADSL applications (i.e., The CPE at one end transmits downstream frequencies);
- Echo canceling ADSL technology or applications that permit the upstream frequency band to overlap the downstream frequency band defined in this document; and,
- Applications that use the power boost option described in ANSI T1.413-1995 (i.e., power level exceeds the PSD templates specified in this document).

4. Potential Incompatibilities and Associated Loop Assignment Guidelines

A. General

4.01 Even when signal power limits are observed, a risk of crosstalk interference still exists when unlike services and technologies are assigned to cable pairs that are in close proximity. The risk of interference is greatest for services and technologies that use high frequencies, such as Digital Subscriber Line (DSL) services/technologies. The potential incompatibilities associated with various services and technologies are identified in this section.

4.02 For each potential incompatible technology combination, corresponding loop assignment guidelines have been developed. While existing BA operational support systems can automatically assign a spare cable pair for a new unbundled loop if one exists, they cannot implement the loop assignment guidelines described in this section. For this reason, the loop assignment guidelines described in this section are ordinarily used after interference is discovered not when a service installed.

4.03 Since existing cable records and operational support systems cannot determine the amount of exposure between any two pairs of a multi-pair cable, and since the integrity of any particular binder group between the CO and the cable terminal serving the End-User location cannot be assured, time consuming manual studies of cable records are not always successful in locating a fully compatible cable pair.

B. Sub-Voice Services

4.04 Interference from sub-voice services carrying unbalanced current pulses (e.g., dc telegraph and alarm circuits) into any other type of services and technologies is possible. When it does occur, such interference usually takes the form of excessive impulse noise. If the cable pair assigned to an unbundled loop is found to have unacceptable impulse noise, BA will attempt to locate a spare pair that meets the applicable impulse noise criteria. (Concerns specific to NYC-see notes in e:mail.)

C. P-Phone Services

4.05 Spectral compatibility studies have shown that there is some potential for interference from P-Phone services into 8 kHz and 15 kHz Program Audio services. The risk is greatest when P-Phone services are assigned to pairs within the same binder group occupied by the 8 or 15 kHz Program Audio service.

D. Digital Data Services

4.06 Spectral compatibility studies have shown that Digital Data Services can interfere with 8 kHz and 15 kHz Program Audio services and single channel analog carrier (ACXR) systems (e.g., SLC-1 or AML).

4.07 Digital Data Services will not interfere with Program Audio services when the two services use pairs in different binder groups.

4.08 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and Digital Data Services may need to be assigned to pairs in different cables in order to prevent the Digital Data Services from interfering with the ACXR technology.

E. Type III PSDS Services

4.09 Spectral compatibility studies have shown that Type III PSDS services which use the Nortel Datapath technology described in ANSI TIA/EIA-596 [20] can interfere with single channel (e.g., SLC-1 or AML), other analog carrier (ACXR) systems, and 15 kHz program audio channels.

4.10 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and Type III PSDS services may need to be assigned to pairs in different cables in order to prevent Type III PSDS services from interfering with the ACXR technology.

4.11 A high binder group fill (88 to 99%) of Type III PSDS services may can cause interference problems with 15 kHz program audio channels. Separate binder groups are recommended in such cases.

F. LANGATE and CO-LAN Services

4.12 Spectral compatibility studies have shown that the DVM technology used for LANGATE and CO-LAN services may interfere with Type II PSDS, Analog Carrier (ACXR) technology, and T1 technology.

4.13 Type II PSDS, which is also known as AT&T CSDC, is no longer available from BA.

4.14 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and the DVM technology used for LANGATE and CO-LAN services may need to be assigned to pairs in different cables in order to prevent the DVM technology from interfering with the ACXR technology.

4.15 There is a potential for some DVM technologies to interfere with T1 technology when the two technologies are assigned to pairs in the same binder group. DVM technology is spectrally compatible with T1 technology when the technologies are assigned to pairs in different binder groups.

G. Local Area Data Channel (LADC) Services

4.16 Spectral compatibility studies have shown that LADC technology can interfere with 15 kHz Program Audio services and ACXR technology.

4.17 LADC services will not interfere with 15 kHz Program Audio services when the two services use pairs in different binder groups.

4.18 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and LADC services may need to be assigned to pairs in different cables in order to prevent the LADC service from interfering with the ACXR technology.

H. Basic Rate ISDN Services and Technologies

4.19 Spectral compatibility studies have shown that there is a potential for Basic Rate ISDN technology to interfere with 15 kHz Program Audio services, extended range DDS technology, Type II or Type III PSDS technology, LANGATE services that use Data/Voice Multiplexer (DVM) technology, and Analog Carrier (ACXR) technology.

4.20 15 kHz Program Audio services and Basic Rate ISDN are spectrally compatible when they use pairs that are located in different binder groups. Pairs in non-adjacent binder groups are preferred, but pairs in adjacent binder groups will usually provide the separation necessary to reduce the exposure enough to provide an adequate increase in the crosstalk coupling loss.

4.21 Extended range DDS technology permits DDS operation on non-loaded loops that exceed the normal DDS range. Extended range DDS technology is compatible with Basic Rate ISDN when the technologies use pairs that are located in different binder groups.

4.22 Type II PSDS, which is also known as AT&T CSDC, is no longer available from BA. Type III PSDS, which is also known as the Nortel Datapath technology, is spectrally compatible with Basic Rate ISDN when the technologies use pairs that are located in different binder groups.

4.23 BA LANGATE service is a Central Office Local Area Network (CO-LAN) service that uses DVM technology. DVMs are compatible with Basic Rate ISDN technology when the range at which the DVMs are deployed is reduced. If DVMs are operated at less than 80% of the maximum specified range, they are spectrally compatible with Basic Rate ISDN when the technologies use pairs in the same binder group. If operated at or above the 80% range, DVMs are spectrally compatible with Basic Rate ISDN when the technologies use pairs in different binder groups.

4.24 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and Basic Rate ISDN may need to be assigned to pairs in different cables in order to prevent the Basic Rate ISDN technology from interfering with the ACXR technology.

I. T1 Technology

4.25 Spectral compatibility studies have shown that there is a potential for T1 technology to interfere with ACXR and ADSL technologies and some types of LANGATE technology.

4.26 LANGATE service is a Central Office Local Area Network (CO-LAN) service that uses DVM technology. There is a potential for T1 technology to interfere with some DVM technologies when the two technologies use pairs that are in the same binder group. T1 technology is spectrally compatible with DVM technology when the technologies use pairs that are located in different binder groups.

4.27 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and T1 technology may need to be assigned to pairs in different cables in order to prevent the T1 technology from interfering with the ACXR technology.

4.28 T1 technology and ADSL technology are spectrally compatible when the technologies use pairs that are located in different binder groups.

J. High-Bit-Rate Digital Subscriber Line (HDSL) Technology

4.29 Spectral compatibility studies have shown that HDSL technology will interfere with 15 kHz Program Audio services, Type II and Type III PSDS, LANGATE services, ACXR technology, and ADSL technology.

4.30 15 kHz Program Audio services and HDSL technology are spectrally compatible when they use pairs in different binder groups. Pairs in non-adjacent binder groups are preferred, but pairs in adjacent binder groups will usually provide the separation necessary to reduce the exposure enough to provide an adequate increase in the crosstalk coupling loss.

4.31 Type II PSDS, which is also known as AT&T CSDC, is no longer available from BA. Type III PSDS, which is also known as the Nortel Datapath technology, is spectrally compatible with HDSL technology when the technologies use pairs that are located in different binder groups.

4.32 LANGATE DVMs are compatible with HDSL technology when the range at which the DVMs are deployed is reduced. If DVMs are operated at less than 80% of the maximum specified range, they are spectrally compatible with HDSL technology when the technologies use pairs in the same binder group. If operated at or above the 80% range, DVMs are spectrally compatible with HDSL technology when the technologies use pairs that are located in different binder groups.

4.33 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and HDSL technology may need to be assigned to pairs in different cables in order to prevent the HDSL technology from interfering with the ACXR technology.

4.34 ADSL technology is spectrally compatible in the same binder group with HDSL technology when HDSL is limited to 12 kft and the **ADSL deployment range is reduced.** What does this mean? (ADSL can operate on a longer loop when there is no HDSL in the binder group. Since BA puts HDSL and ADSL in the same binder group, a CLEC deploying ADSL should assume that HDSL will be in the same binder group and restrict the length of loops that they use for ADSL accordingly.)

K. ADSL Technology

4.35 Spectral compatibility studies have shown that ADSL technology will interfere with 15 kHz Program Audio services, Type II and Type III PSDS, LANGATE services, ACXR technology, and some ADSL applications.

4.36 15 kHz Program Audio services and ADSL technology are spectrally compatible when they use pairs in different binder groups. Pairs in non-adjacent binder groups are preferred, but pairs in adjacent binder groups will usually provide the separation necessary to reduce the exposure enough to provide an adequate increase in the crosstalk coupling loss.

4.37 Type II PSDS, which is also known as AT&T CSDC, is no longer available from BA. Type III PSDS, which is also known as the Nortel Datapath technology, is spectrally compatible with ADSL technology when the technologies use pairs that are located in different binder groups.

4.38 LANGATE DVMs are compatible with ADSL technology when the range at which the DVMs are deployed is reduced. If DVMs are operated at less than 80% of the maximum specified range, they are spectrally compatible with ADSL technology when the technologies use pairs in the same binder group. If operated at or above the 80% range, DVMs are spectrally compatible with ADSL technology when the technologies use pairs that are located in different binder groups.

4.39 Bell Atlantic is phasing out ACXR technology. In the meantime, ACXR technology and ADSL technology may need to be assigned to pairs in different cables in order to prevent the ADSL technology from interfering with the ACXR technology.

4.40 RADSL applications are compatible with ADSL DMT applications when both technologies are in the same binder group however RADSL technology will probably reduce the data rate or operating range of ADSL DMT technology if it uses an upstream bandwidth that is greater than that of ADSL DMT technology.

4.41 ADSL applications that have spectral energy at power levels or in frequency bands that can interfere with unbundled 2WDA loops and ADSL technologies are not permitted. Such applications include:

- Reverse ADSL applications (i.e., End-user CPE transmits downstream frequencies and CO equipment transmits upstream frequencies);
- End-user to end-user ADSL applications (i.e., The CPE at one end transmits downstream frequencies);
- Echo canceling ADSL technology or applications that permit the upstream frequency band to overlap the downstream frequency band defined in this document; and,
- Applications that use the power boost option described in ANSI T1.413-1995 (i.e., power level exceeds the PSD templates specified in this document).

old std

L. Loop Assignment Guidelines

4.42 The potential incompatibility problems associated with the various services and technologies have resulted in loop assignment guidelines that are intended to mitigate crosstalk interference after such a problem is identified. A summary of the loop assignment guidelines as they relate to unbundled loops is provided in Table 4-1.

Table 4-1: Spectrum Management Assignment Guidelines for Unbundled Loops

(1) Unbundled Loop Service (ULS) Other Services and Technologies	2WA	2WACSS or 4WACSS	2WD56*	2WDI	4WD1.5 (using T1)	2WDH or 4WDH	2WDA
Sub-Voice	C(2)	C(2)	C(2)	C(2)	C(2)	C(2)	C(2)
Voice Grade 2WA ULS 2WACSS ULS 4WACSS ULS	C	C	C	C	C	C	C
P-Phone	C	C	C	C	C	C	C
15 kHz Program Audio	C	C	C	(3)	C	(3)	(3)
DDS Type I PSDS 4WD56 ULS	C	C	C	(4)	C	C	C
Type II PSDS Type III PSDS	C	C	C	(5)	C	(5)	(5)
LADC	C	C	C	C	C	C	C
LANGATE CO-LAN	C	C	C	(6)	(5)	(6)	(6)
Basic Rate ISDN 2WDI ULS	C	C	(4)	C	C	C	C
Analog Carrier	C	C	(7)	(7)	(7)	(7)	(7)
T1 4WD1.5 ULS (using T1)	C	C	C	C	C	C	(8)
DS1 using HDSL 2WDH ULS 4WDH ULS	C	C	C	C	C	C	C(9)
InfoSpeed DSL 2WDA-R ULS 2WDA-C ULS	C	C	C	C	(8)	(9)	C(10)

C = Compatible when assigned to pairs in the same binder group.

Notes:
(1) Other types of unbundled loops will be considered upon receipt of a bona fide request.
(2) If an impulse noise problem occurs, BA will attempt to find a spare pair that meets applicable impulse noise criteria.
(3) Separate binder groups often provide spectral compatibility. Non-adjacent binder groups preferred.
(4) Separate binder groups provide spectral compatibility for Extended Range DDS technology.
(5) Separate binder groups provide spectral compatibility.
(6) Separate binder groups provide compatibility when DVMs cannot be operated at < 80% of max range.
(7) Separate cables provide spectral compatibility.
(8) Separate non-adjacent binder groups provide spectral compatibility.
(9) HDSL may reduce the operating range of ADSL technology when both are in the same binder group.
(10) Compatible for supported ADSL applications. See 4.41 for a description of the ADSL applications that are not supported.

5. Facility Augmentation

5.01 The provisioning of unbundled loops is subject to the availability of existing suitable facilities on a first-come first-served basis.

5.02 Unbundled loop offerings do not create an obligation on the part of BA to construct a specific type of loop facility, such as a non-loaded metallic cable, in order to support a particular type of unbundled loop.

5.03 When an existing suitable facility is not available for a particular type of unbundled loop, the CLEC may choose to avail itself of BA's special construction services. We need to be careful here. We are not offering special construction services or the "build-out" of copper facilities to allow for the provision of xDSL services where copper facilities do not already exist. (Agreed. that's covered by the next paragraph.)

5.04 Metallic facilities are in decreasing supply because they are being replaced in many areas by fiber facilities. For this reason, no guarantee can be made that any metallic facility will continue to be available in the future. However, we do have notification requirements where advanced services are currently deployed. These requirements have been put in place by the FCC. (True, but no need to mantion that here.)